FILE COPY FOREST PROJECT LABORATORY, STANFORD UNIVERSITY CALIFORNIA

526.f
636.f

SI
Pi - Paulina

Copy for Mr. Miller

REPORT ON THE EXAMINATION

OF THE

INSECT INFESTATION OCCURRING ON THE PAULINA

NATIONAL FOREST.

J. F. Pernot,

Forest Examiner.

November 15, 1913.

Report on the Examination of the Insect Infestation Occurring on the Paulina National Forest.

Introduction.

The presence of a severe infestation of barkbeetles in pine timber on the Paulina National Forest was first brought to the attention of the District office in the summer of 1913. An examination of the infested areas was, therefore, made during late September and early October, 1913, for the purpose of determining the character and extent of the depredations and the possibility of relieving the situation through artificial control operations.

Character of the Infestation.

The insect infestation on the Paulina National Forest occurs in lodgepole pine, yellow pine, and western white pine. Timber of all three species is being killed by the Mountain Pine Beetle (Dendroctonus monticolae Hopk.), while the yellow pine also is suffering from the attacks of the Western Pine Beetle (Dendroctonus brevicomis Lec.). Unless otherwise indicated, the infestation of Dendroctonus monticolae alone will be referred to in this report.

Region Involved.

The portion of the insect infested areas examined lies in the southern part of the Paulina National Forest, in

T 26, 27 and 28 S, R 11 and 12 E, W. M. Here occurs the most heavily infested body of timber on the Forest, although insect work is known to occur in lodgepole pine stands to the west, and also south to the boundary of the Klamath Indian Reservation.

The northern limit of the infestation is in an area of about 500 acres in Sec. 8, 9 and 10, T 26 S, R 12 E, where scattered bodies of lodgepole pine and yellow pine are dead and infested at the present time. This is designated as the Crescent Road area, as it lies within one or two miles north of the Crescent-Silver Lake road.

The largest and heaviest area of infestation, covering roughly about 16,000 acres, lies in that portion of the Forest surrounded on three sides by private holdings in T 27 and 28 S, R 11 and 12 E. This is designated as the Timothy Meadows area, as the heaviest belt of the infestation crosses this portion of the Forest in the region surrounding and to the south of the Timothy Meadows Ranger Station. Between the Crescent road area and the upper end of the Timothy Meadows area in the northern part of T 27 S, R 12 E, there are occasional groups of infested trees but no extensive areas of infestation. South of Sec. 19, 20, and 21, T 27 S, R 12 E, the infestation is light and more scattered than in the northern end of the township.

The third distinct area of infestation that was examined is in the region surrounding the Antelope Flat Ranger

Station in Sec. 29, T 28 S, R 12 E. Here an area of about 1200 acres is involved within the National Forest. There is also considerable infested timber on private holdings, both to the north and south.

The actual areas over which infested timber is scattered on Forest lands alone, is roughly between 17,000 and 18,000 acres, while the areas included within the exterior limits of the infestation, both on the National Forest and on surrounding private holdings is not less than 30,000 acres.

The topography of the region is rough, as it consists mostly of rolling hills and ridges and occasional higher rocky points. Between the more prominent ridges occur irregular flats from which rise rocky or round buttes, while on the lower portions, especially near the southern end, the flats are more in the nature of natural meadows. A few rather deep, dry canyons and occasional rims cross the areas at various points. The range in altitude is from 4800 feet at Antelope Flat in the south part of T 28 S, R 12 E, to 7400 feet on the summit of Bald Mountain in Sec. 36, T 26 S, R 11 E.

No streams of any size rise within or traverse this region, as nearly all of the water courses are dry during the summer season. Water is scarce, being furnished by six or eight springs often from four to eight miles apart.

The soil throughout nearly the entire region consists of a light pumice sand, from a light fine powder in the

meadows, to a mixture of fine and coarse fragments on slopes and flats. There are also many lava outcrops and rims at the higher elevations and in the draws and canyons.

In this region there are only four principal tree species,- yellow pine, lodgepole pine, white fir and western white pine. Sugar pine and mountain hemlock occur sparingly in various situations, the sugar pine on dry ridges and the hemlock on the highest summits and around swampy meadows.

In the infested areas, the forest cover consists primarily of lodgepole pine, much of it nearly pure stands on ridges and pumice flats. From the Crescent Road area in T 26 S, R 12 E, south through the Timothy Meadows area to T 28 S, R 12 E, a belt of lodgepole pine extends through the central and higher portion of this part of the Forest. Here, the lodgepole pine occurs in pure stands, or in mixture with small percentages of white fir and western white pine. The stand of lodgepole pine varies from a few small scattered trees per acre on many of the pumice flats, to 200 to 600 trees per acre in more favorable situations along the water courses and on the ridges and buttes. White fir occurs principally on the slopes, while western white pine is abundant only on a few of the steep and rocky north slopes. On the south sides of buttes and ridges rising out of the lodgepole pine flats, there is usually a small percentage of mature yellow pine.

To the east and west of this principal belt of lodge-

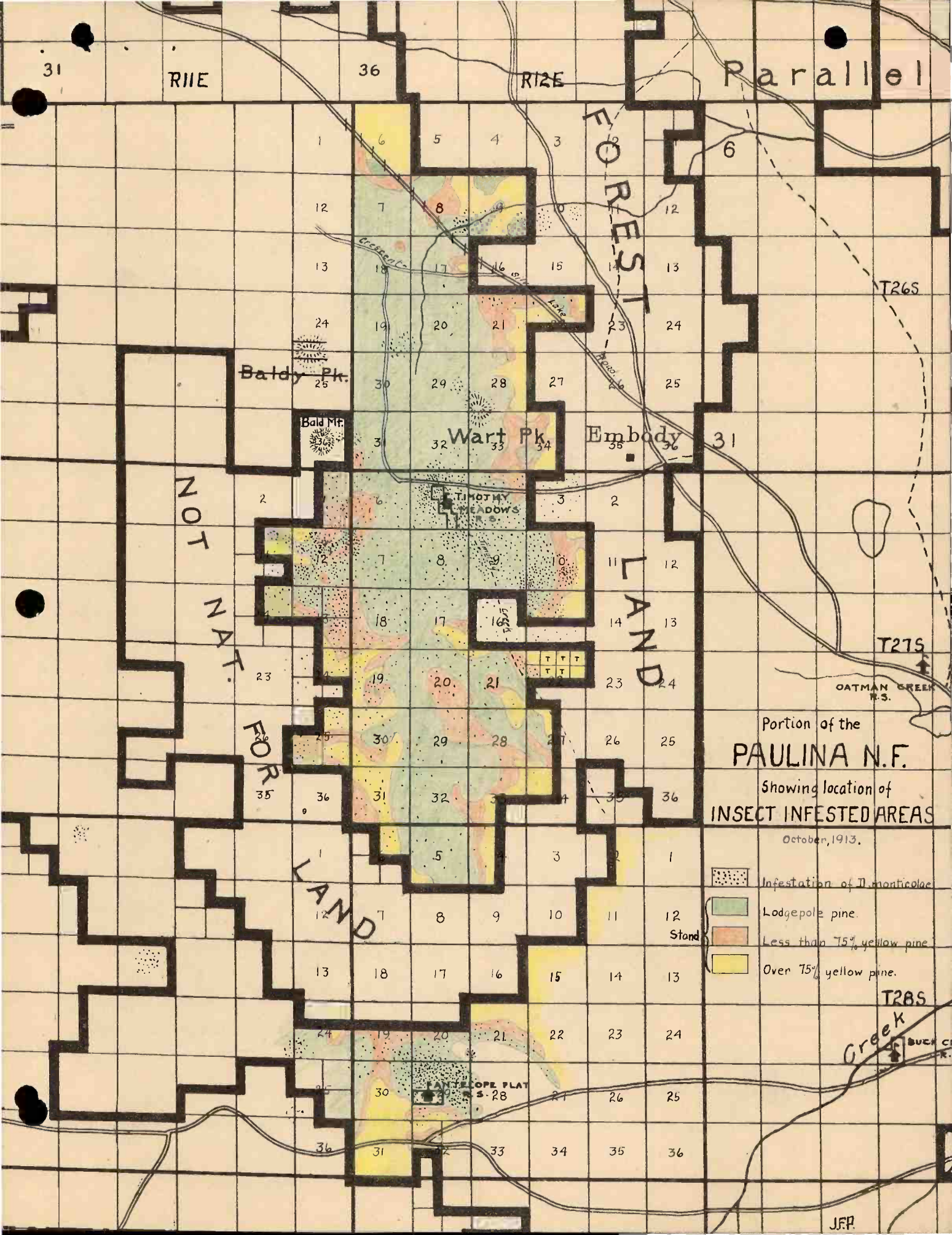
pole pine, the stand gradually becomes a mixture of lodgepole pine and yellow pine towards the lower elevations, while within this portion of the Forest, along the eastern, western and southern boundaries, there are numerous small areas covered by nearly pure stands of yellow pine. The distribution of the forest cover is shown on the accompanying map, compiled from the extensive reconnaissance plats prepared by Forest Examiner Jacobson.

Surrounding this nearly isolated body of the National Forest, is a strip of private holdings from one to four miles in width, carrying, for the most part, an excellent stand of yellow pine. With much of it is mixed small percentages of lodgepole pine, especially in those sections that border on the National Forest.

To the south of this yellow pine belt in T 28 S, R 12 E, this species is, in many places, abruptly replaced by lodgepole pine on the Forest in the region of Antelope and Bear Flats. The division between the lodgepole pine areas and the bodies of merchantable yellow pine, is followed fairly closely by the Forest boundary.

The Infestation of Dendroctonus Monticolae.

Observations made in many portions of the infested areas show that the presence of Dendroctonus monticolae is not a new thing in the forests of this region. Evidences of its work in old infestations are abundant in lodgepole pine


R11E
R12E
Parallel
FOREST
NOT NAT. FOR LAND
Baldy Pk.
Bald Mt.
Wart Pk.
Embody
T26S
T27S
TIMOTHY MEADOWS R.S.
OATMAN CREEK R.S.
SANTELOPE FLAT R.S.
Portion of the
PAULINA N.F.
Showing location of
INSECT INFESTED AREAS
October, 1913.
Infestation of D. monticolae
Stand
Lodgepole pine.
Less than 75% yellow pine.
Over 75% yellow pine.
T28S
Creek
J.F.P.

stands, but not in stands of yellow pine. The present cycle of the infestation evidently had its beginning about four or five years ago, and it has gradually been gaining headway since that time. Now, it has apparently nearly reached its culmination, or will within the next one or two years, which will result in the killing of a large percentage of the lodgepole pine, at least on the areas invaded. Lodgepole pine that has been killed by this beetle during the last three years is abundant on flats south of Timothy Meadows, in lodgepole pine/yellow pine stands in the western part of T 27 S, R 12 E, and around the infested areas and meadows in the Antelope Flat region. A heavy body of small lodgepole pine also was killed several years ago on the south and east slopes of Wart Peak in the southern part of T 26 S, R 12 E.

Up to the season of 1912-13, the work of Dendroctonus monticolae occurred almost entirely in lodgepole pine and associated scattered white pine. A very small percentage of yellow pine in mixed stands near the Forest boundary, both within and outside of the National Forest, in T 27 S, R 11 and 12 E, was infested in 1912 and is now dead. The increase of the infestation in yellow pine in 1913 over that infested in 1912 is at least 25%. This is in mixed stands. There are still extensive bodies of lodgepole pine in these two townships that will probably be, to a great extent, killed during the next two or three years. It is almost certain, however, that the infesta-

tion will continue in yellow pine in stands where it occurs with infested lodgepole pine, but the amount of damage that will result to merchantable timber is problematical and can be only very roughly estimated.

Estimates and Percentages of Infestation.

As a basis for any recommendations for or against the adoption of control measures, specific estimates of the numbers of infested trees in the heaviest centers that threaten merchantable stands, also general estimates for the entire region were obtained.

Antelope Flat Area.

The main body of the infestation in this portion of the Forest Service covers roughly about 1200 acres, mostly in pure lodgepole pine stands. There are also a number of smaller, scattered areas on included homestead and timber claims, and on private holdings adjoining the National Forest.

As there is no uniformity in the distribution of the infested trees, even throughout the heaviest areas of infestation, strip estimates alone were necessarily used in order to arrive at the approximate number of trees involved. Where the infested areas were small, an actual count of the trees often was possible.

The following counts and estimates apply to the Antelope Flat area:

T 28 S, R 12 E:

Sec. 21, 22, 27,-

A total infested area in lodgepole pine of 250 acres. Total number of infested trees by actual count - 260. This is in a narrow strip of lodgepole pine between Antelope Flat Meadow and a nearly pure stand of yellow pine to the north.

Sec. 20,-

An infested area of 150 acres in lodgepole pine. Total of infested lodgepole pine, based on actual count and estimate, - - - - - - - - - - - - - - - 200.

Sec. 20 and 21,-

Isolated area of 15 acres in Antelope Flat meadow. Number of infested lodgepole pine by actual count- 280.

Sec. 29,-

Heavily infested area of 300 acres of lodgepole pine. Average of 17 trees peracre infested over the entire area, - - - - - - - - - - - - - - - 5,100.

Sec. 19 and 20,-

Infested area of 200 acres in lodgepole pine and mixed stands. Average of 10 trees per acre infested, - 2,000.

This gives an estimated total of 7,840 infested trees on approximately 1,200 acres of severe infestation on this area, within the National Forest. From the estimate and

map it will be seen that the heavy center of the infestation in this area is in Sec. 20, 29 and 30, T 28 S, R 12 E, to the north and west of Antelope Flat Ranger Station.

Timothy Meadows Area.-

This area extends from the northern part of T 27 S, R 12 E, south through this township and T 27 S, R 11 E, mostly within the National Forest. There is also much infested timber, mostly lodgepole pine, in adjacent private holdings.

The heaviest centers of infestation in this area are in the vicinity of Timothy Meadow Ranger Station in Sec. 4, 5, 8 and 9, Sec. 10 and 15, Sec. 6 and 7, T 27 S, R 12 E, and south of Bald Mt. in Sec. 1, 12 and 13, T 27 S, R 11 E. On these areas the infestation is not uniform, as the greater number of trees occur in scattered groups and patches, from 5 to 20 acres in extent. Between heavily infested patches occur infestations of previous years, open pumice flats where there is little lodgepole pine, and areas of slightly infested and non-infested timber.

Near the boundary of the Forest, for several miles south of Timothy Meadow Ranger Station, where the stands are composed of varying percentages of lodgepole pine and yellow pine, there has been and still is much infestation in lodgepole pine. Scattered yellow pine trees also have been killed. South of Sec. 19, 20 and 21, T 27 S, R 12 E, the infestation is light and more scattered than in the northern part of the township.

The extent of the Timothy Meadows area made it impossible to cover and estimate separately each section. In order to obtain an approximate estimate of the number of trees infested at the present time, 7½ miles of percentage strips were run through various representative portions of the area.

The results of several of these estimates are given in order to show the diverse nature of the infestation under different conditions:

T 27 S, R 12 E:

Sec. 3 (outside of the Forest),-

On two 2-chain strips across the section, aggregating an area of 32 acres, there are 272 lodgepole pine and 5 yellow pine infested with Dendroctonus monticolae. This gives an average of 8.5 infested lodgepole pine and .16 yellow pine per acre.

Sec. 4,-

A strip 1-chain wide in the SW¼, having an area of 4 acres, has 26 infested lodgepole pine from 6 to 12 inches in diameter. This gives an average of 6.5 trees per acre infested.

Sec. 5,-

In the areas of infestation on 1-chain strips, aggregating an area of 20 acres, there are 240 lodgepole pine trees infested or an average of 12 trees per acre.

Sec. 7,-

In the NW¼ a 1-chain strip having an area of 4 acres, has 52 infested trees, or an average of 13 trees per acre.

Sec. 9,-

Through open lodgepole pine stands and open pumice flats, across the middle of the section, there are on 8 acres 56 infested lodgepole pine or an average of 7 trees per acre. This section is nearly representative of the infested stands of lodgepole pine in the Timothy Meadow area.

Sec. 19,-

In the SW¼, through a mixed stand of lodgepole pine, yellow pine and white fir, there are on a 2-chain strip, having an area of 8 acres, the following:

Yellow Pine		Lodgepole Pine	
Non-infested,	93%	Non-infested,	68%
Infested,	-	Infested,	9%
Dead,	7%	Dead,	23%

The stand of yellow pine averages about 10 M ft. B. M. per acre, of which 12% has been killed by insects, principally the Western Pine Beetle (Dendroctonus brevicomis). The average number of infested lodgepole pine per acre is 3.25 trees.

There are approximately 20 sections or 12,800 acres in the main body of the infestation within the National Forest, in the Timothy Meadows area. Giving careful weight to the extent and severity of the infestation in various portions, it is estimated that there is an average number of 8 infested lodgepole pine trees per acre throughout this area. This makes an estimated total of 102,400 infested trees for the Timothy Meadows area in the National Forest alone.

Crescent Road Area.-

This area lies in Sec. 8, 9 and 10, T 26 S, R 12 E. That portion of it in Sec. 8 and 9, within the National Forest, covers approximately 300 acres in lodgepole pine and lodgepole pine-yellow pine stands. Percentage strips through Sec. 9 and 10 give an average of 7 infested lodgepole pine per acre or an approximate number of 2,100 infested trees on this area within the National Forest.

Between this area and Bald Mountain to the south, there is a small infested area in pure lodgepole pine, covering about one-quarter-section in Sec. 19, 20 and 30, T 26 S, R 12 E. Here it is estimated that there are approximately 1,400 infested lodgepole pine.

Summing up the estimates for the various areas as follows:

Antelope Flat,	7,840
Timothy Meadows,	102,400
Crescent Road,	3,500

gives, in round numbers, 114,000 infested lodgepole pine in this portion of the National Forest.

Economic Aspects of the Pauline Infestation.-

From the time the present infestation began up to the season of 1912-13, the work of Dendroctonus monticolae was confined almost entirely to lodgepole pine. This was principally in pure stands, although some lodgepole pine and occasional yellow pine in mixed stands were also killed. Beginning with the season of 1912, the increase of the infestation in yellow pine is decidedly apparent. There is at least a 25% increase of yellow pine infested in 1913 over that killed in the 1912-13 infestation.

If the infestation had remained in lodgepole pine alone, it would have received little consideration from the viewpoint of possible control operations. The infested bodies of timber of this species on the National Forest are nearly surrounded by yellow pine stands on private holdings, which, on account of lack of transportation and limited demand, will be held for a number of years at least. There is absolutely no demand for living lodgepole pine in this region at the present time, and no prospects of utilization for many years.

The spread of the infestation to yellow pine is more serious. Particular attention was called to this phase of insect activity through the Klamath-Lake Counties Fire Association, which controls nearly all of the private holdings in the yellow pine surrounding this portion of the Nat-

ional Forest. Mr. Kimball, the Secretary of the Association, expressed a fear that serious damage will result in the heavy stands of this species after the lodgepole pine is infested and killed.

So far no great damage to yellow pine has occurred on private holdings from the work of Dendroctonus monticolae, as most of the yellow pine that is either dead or infested is within the National Forest. Areas where the greatest amount of yellow pine has been killed, are in Sec. 9, within the National Forest, and Sec. 10 outside of the Forest, T 26 S, R 12 E, within the Forest in the N½ Sec. 10, the N½ Sec. 15, T 27 S, R 12 E, and Sec. 12, T 27 S, R 11 E, and in private land bordering on these sections. In the N½ Sec. 15, T 27 S, R 12 E, at least 10% of the yellow pine in mixed stands was infested in the summer of 1913 and will be dead within another year.

The yellow pine infested or dead, is in all cases in mixed stands where varying percentages of the lodgepole pine has previously been killed. From studies of insect infestation throughout the entire Eastern Oregon region, it is very evident that yellow pine is the most endangered when it occurs in mixture with lodgepole pine that is or may become infested with Dendroctonus monticolae. Evidences of the work of this beetle to any marked degree in pure yellow pine stands have not been found. Nearly all of the yellow pine within this portion of the National Forest, also much of that on private

holdings near the Forest boundary is in mixture with lodgepole pine. Under these conditions it is almost certain unless the infestation is brought under control through natural or artificial means, within the next one or two years, that some of the yellow pine will be killed.

In those portions of T 27 S, R 11 E, and T 27 S, R 12 E, in the National Forest, covered by or bordering on the Timothy Meadows area, there are roughly about 27 million feet of yellow pine timber. Of this, about 7 million are in stands that contain less than 75% of yellow pine. The amount of this species in such stands varies from 5 to 75 percent, and from several hundred feet to 6M or 7M feet B.M. per acre. Approximately 20 million feet of yellow pine occur in stands composed of more than 75% of this species, the amount varying from 75 to 100 percent. Small areas have from 14 to 16 M ft. B.M. per acre, while the average of this species alone is between 8 and 10 M ft. B.M. per acre, where the amount of yellow pine is between 80 and 90 percent.

Less than 10 million feet of National Forest yellow pine is immediately threatened by the heaviest centers of infestation in the northern end of the Timothy Meadows area. Even with a very severe infestation, it is not probable that over 30% of the yellow pine would be killed in stands that contain less than 85% of lodgepole pine that is, or may be infested within the next two or three years. It is believed that from 50% to 80% of the yellow pine may possibly be killed,

where this species is scattered and lodgepole pine constitutes over 25% of the stand. This is assuming that the infestation continues to increase in a proportionate ratio to its development during the last two years. If these percentages of the stand are killed, it will involve between two and three million of scattered yellow pine on the National Forest. The yellow pine on mixed stands on surrounding private holdings would be similarly affected.

Immediate serious damage to yellow pine is not anticipated in the southern end of the Timothy Meadows area, in the Antelope Flat area, and in the Crescent Road area. Around the Antelope Flat area there is much yellow pine, both within and outside of the National Forest, that will be threatened if the infestation continues its increase and spread.

Estimated Cost of Control.-

In the control operations conducted in similar stands of timber on the Ochoco National Forest in the spring of 1913, the total cost of the entire project, exclusive of supervision, averaged [illegible].50 per tree or $3.42 per M ft. B.M. In the general operation on the Paulina National Forest, this figure, which is low for an intensive project, could not be attained.

The infestation is spread over at least 16,000 acres, and is not confined to distinct watersheds, under which conditions control operations usually have been con-

ducted. Throughout the entire area there is a great scarcity of water, so that camp sites, if located near the few existing springs, would often be from to six miles from infested areas. Other problems confronted are the scarcity of labor and the high cost of all supplies. The nearest town, Silver Lake, is 20 to 25 miles from the infested areas, and about 85 miles from Bend, the nearest railroad point.

Taking all these factors into consideration, it is believed that the cost of control operations would be not less than $.60 per tree. This is by the ordinary methods of control, namely, falling and burning or barking the infested trees. At this figure, it is estimated that it would cost $68,400. to clean up only the three main areas of infestation on the Paulina National Forest, to say nothing of scattered insect work throughout the region and the areas on private holdings. This figure would more than cover the value of all the yellow pine threatened on this portion of the Forest, assuming stumpage to be worth $2. It is, therefore, useless to consider the control of the entire infestation by the methods usually employed. Even if sufficient funds were available for this work, it would be almost impossible to perfect an organization for its execution during a short season of two or three months.

On the other hand, it is mainly in the lodgepole pine and lodgepole pine-yellow pine areas on the National Forest that the infestation has had its incipience. These stands still are a great breeding ground for Dendroctonus monticolae,

and are, if the infestation continues in severity, a menace to much yellow pine on private holdings.

Apparently the only feasible solution of the problem is for the Forest Service to initiate control operations on a small scale, in cooperation with the Klamath-Lake Counties Forest Fire Association. These operations would necessarily be confined to areas where the yellow pine is most threatened, both within and outside of the National Forest. Five or six thousand trees might be cut and treated at an expense of $3000. to $3500., thereby giving possible protection to valuable stands. We have little assurance, however, that it would have any marked effect upon the spread of the beetles, owing to the great extent of the infestation that would still remain.

The inadequacy of the methods of insect control ordinarily recommended, is only too apparent in the case of extensive infestation. Other methods must be devised for the destruction of the infesting beetles, when the infestations occur simultaneously over large areas, as they have done in the Paulina and other regions.

Wholesale burning of the heaviest centers of infestation in lodgepole pine has been suggested, and it is believed that this is a plan worthy of careful consideration. If control operations are attempted on the Paulina National Forest in 1914, it is recommended that the possibilities and value of this method be determined, not by theory and conjecture, but by actual experiments in the field.

There are many areas of heavily infested, nearly pure lodgepole pine on the Paulina National Forest, where such an experiment might safely be attempted.

Summary and Conclusions.

To briefly sum up the insect situation on the Paulina National Forest: The gross area of the infestation is not less than 30,000 acres, of which approximately 17,500 acres are included in the main centers of distribution on the National Forest alone. On these 17,500 acres there is an estimated number of 114,000 infested trees, which would cost at least $.60 per tree (total cost) for treatment by the ordinary methods. This would make the cost of a general operation on the Forest alone, nearly $70,000., more than the value of all of the yellow pine in this portion of the National Forest.

We have no means of determining how long the present cycle of infestation will continue, or to what extent the yellow pine will be killed, both on the National Forest or on private holdings. From the present appearance of the infestation and from experience in other regions, it is almost certain that considerable yellow pine will be killed in mixed stands. As the infestation had its beginning mainly on the National Forest, unless some action is taken by the Forest Service, it is unquestionable that its attitude and policies will be bitterly attacked if serious damage eventually occurs to the timber of the region.

There is no present demand and no prospect of utilization for many years, of the National Forest timber involved. Nearly 50% of the lodgepole pine on the three areas described is either dead, or is infested and will be dead within one more

year.

The yellow pine on this portion of the National Forest is scattered, and while the heavy stands on small areas may eventually bedisposed of when logging operations reach this region, much of it in mixed stands probably never will be removed.

It remains an open question whether the Forest Service should, and to what extent, appropriate funds partly in an attempt to protect the best of this timber, but mainly to uphold its policies in regard to general forest protection.

File

Paulina Project. -Investigation-

Pursuant to instructions, issued Sept. 8. 1914., wherein it was required, an examination of the Paulina National Forest and surrounding areas, be taken up, with a view to determine whether or not beetles are infesting the yellow pine in the vicinity of the infested lodge-pole, and whether or not there is a marked general increase in the infestation in the yellow pine areas".

This work was taken up Oct. 6 and finished Oct. 20. 1914. The method employed; was the running of lines into the forest from central or established bases, an examination being made on each side of same from a sixteenth to an eighth of a mile in width. Of these lines, approximately, seventy miles in length; were ran with a view of keeping on the border or the points where the two species of pine meet, as well as to intersect the larger bodies of lodge-pole that extend into the yellow pine, particular attention being given to points where inter-mingling of the infestation was noted a year ago. (See map and field-notes.)

As a result of the investigation, the following is submitted;

The most surprising change in the situation and the first to be taken into consideration, in this investigation, is the whole-sale disappearence of Den. monticolae infestation from the lodge-pole areas, that were so heavily infested, a year ago.

As to why this change occurred and,as to what finally became of the broods,that,I am positive,escaped from the timber,last spring; I have only a few theories to advance and facts-relatively few- to support them. As they are; As follows:

The season opened,from a month to six weeks earlier,in this section, last spring,than has occurred before in years and due to this,insect life became active much earlier than in any recent,former year. In the face of this,this seasons attack,by the Monticolae,is from six weeks to two months later than a year ago.

Every condition of the abandoned trees gives evidence of the broods having escaped,regularly and normally,some time,last spring.

The only conclusion I can arrive at,is,the main body of the 1913 broods,due to favorable climatic conditions, emerged in the early spring,and after emerging,either perished,on account of later severe weather or migrated to other parts,leaving the present weakened infestation to be made up of the backward broods,developing and emerging,later in the season.

Whether the beetles perished,after emerging or migrated from the region,is a question upon which I can find no grounds to base an answer;but am inclined to a belief in the latter for the following reasons:

1st. There is no evidence,in the green timber,in the form of successful,ineffectual or partial attacks,by the beetles,having been made prior to August and September. It would appear,unless these broods were annihilated within a very short period some traces of their work would have remained.

2nd. Continued,unusal heavy winds from the north,during the spring and early summer months,which,by catching the beetles under favorable conditions,may have drifted them to a considerable distance.

My assertion as to the prevalence of this north wind, is based upon general comment in regard to it and to the damage it has wrought through-out the entire district, such as drying up of water, ruin of crops and all in all, a general drought.

3rd. The statement to me, by Forest Ranger Elder of Paisley, Oregon., of the presence of a large, new insect infestation in the lodge-pole, about forty miles to the south of the areas examined, on the head-waters of the Sprague and Sycan rivers. As per Mr Elders statement, this body of timber has recently faded out and from his description of conditions would correspond very closely with the work of the broods, emerging last spring, from the areas in question.

The above are not given with an idea that they furnish any amount of authentic proof of the migration of these insects; but are set forth as they exist and for just what they are worth and I would not care to advance them only as the foundation of a theory, that at best, can have but little weight; yet, it is all I have. I am only sure of a few things; namely:

1st. The monticolae infestation was in the lodge-pole, in a healthy, thriving condition, late in 1913.

2nd. It is not in the lodge-pole (or elsewhere), to any extent, at the present time, having been reduced, as compared with 1913, from 70 to 90 per cent.

3rd. This infestation developed and emerged regularly and normally, some time last spring.

4th. The remaining infestation is in a weakened, backward condition -not having advanced beyond the half-grown larvae stage and has not reached the point where it has affected the foliage in any way, that could be noticed.

Relative to Den. monticolae infestation, in the yellow pine:

As an opening statement, I wil say: Upon my entire trip from Ashland, Ore. and return, covering a period of fifteen days and during which time, every suspicious looking tree was examined, and in which time, over twelve hundred trees were inspected, by aid of the ax; I did not see a yellow pine tree that was, either, killed or attacked by monticolae, in the year 1914.

That some little monticolae infestation is in the yellow pine, I do not doubt. It is possible and very likely; but to say that it exists in any way that would represent a menace to the forest, is entirely out of the question. A close examination of the different points, where the yellow pine gave evidence of taking on this infestation, in 1913, leads me to believe, that, if any amount of this infestation was in existence, I would have discovered some of it. (SEE field notes)

It is useless to bring forward unsupported conclusions, conjectures and theories relative to the disappearance of this infestation. As to why, when and where, I can not say. I only know, that it is not in the timber of these forests, at the present time.

Den.brevicomis in the yellow pine.

Here we meet with a different condition. This infestation,in place of decreasing,as in the case of the Monticolae,is steadily increasing and in a way that will,soon demand the attention of the timber-man of those parts.

Owing to the enormous and extensive stand of yellow pine and to the comparatively few trees that are killed,it is difficult to realize the amount of loss,unless a careful examination is made: Also,owing to this forest bordering the lodge-pole belts,where so much destroyed timber is in evidence and where the spasmodic and spectacular attacks of the Monticolae have taken place,in the last few years;leads the owners to over look the real danger,that is creeping upon them quietly,but never the less, surely and to forget that they can better afford to turn their attention to the saving of one yellow pine tree,than to acres of lodge-pole forest.

The magnitude of the fancied danger has eclipsed,and completely turned attention from the real one and in consequence this infestation is generally scattered throughout the yellow pine belt and is increasing,from year to year,in a way,that establishes the fact that it is a menace,and taking into consideration the entire investigation,the only menace worthy of any serious attention,in these bodies of timber,at the present time.

It is to hoped,that those interested,will take action,in a way that will check this depredation before further loss occurs and while it is yet in a state that will require no great expenditure to obtain results. It is a fact,that the toll collected

by these insects is in excess of all other out-lay and up-keep-taxes, wages,etc.,and to this can be added the loss by fire. When the owners of this property,come to a realization of this condition,some thing may be accomplished along control lines; but at present,very little can be seen except the huge devastation, surrounding these areas and nothing considered except the extermination of a vast body of timber, that has been deserted by the insect for six months or more.

In making this examination,of the yellow pine forests; a number of tracts were selected that were examined a year ago and where the infested treas of last year are marked. As a result of the prsent examination,it can be safely asserted,that this years infestation shows an increase of from 25% in localities to 60% in others. An increase,generally,of,at least 40% throughout.

The estimates in this report are arrived at by a comparison of the number of trees destroyed last year and those dying in the spring and summer of 1914. No condideration were given the normal green andslightly fading trees,that contain parent adults and beetles in the larval stage,in which the broods are preparing to pass the coming Winter.

I hope the data,as gathered,contains the information required and that,this report gives a sufficiently,clear understanding of the same. The statements set forth,I am prepared to substantiate.

Submitted Nov.6.1914.

Ent.Ranger.

Jules

Paulina Project. -Investigation-

Field Notes.

Embody Mill. Oct.12.1914.

Meanders:

Start from mill-NE Cor Sec.35:Thence north 3 miles to NE Cor.Sec. 14: Thence west 1 mile to NW Cor. Sec.[illegible] Thence south 1½ miles to west quar.Cor. Sec.23:Thence angled across SW quar.Sec.23 and Sec.26: To place of beginning. All in Twp.26S.R13E.WM.

The above line is run on the border of the lodge-pole and yellow pine and leads through an area,where it was considered the Monticolae infestation in the lodge-pole threatened the yellow pine(See letter to Dr.Hopkins of Nov.11.1913.,reference to Sec.14.Twp.26S.R 12E. WM.)

The decrease of the Monticolae infestation in the lodge-pole pine,as compared to that of 1913,is very evident;running as high as 90% in places and there is no doubt but that the decrease will reach a general average of 70% in this area.

As compared to 1913,the opperations of the Monticolae are from six weeks to two months later and in consequence the foliage has not faded on the trees struck;never the less,a close examination of the forest shows the greater number of the lodge-pole trees to be free from infestation,standing in the midst and surrounding the dead timber of of last year.

The present Monticolae infestation is inthe form of larvae and parent adults. The emergence,last spring,appears to be some what irregular;but I would judge 80% escaped from the burrows. Preditors are numerous.

The recovered trees and partial attacks in the living timber would indicate a weakened condition of the remaining broods. A number of such are in evidence in the lodge-pole areas.

A careful examination made, along the entire line, in the yellow pine fails to show a single tree killed or attacked by Monticolae in 1914; while on the other hand, a decided increase is noted in the ravages of the Breviconis, in this timber-fully 25% over a year ago-.

Embody Mill. Oct. 13, 1914

Meanders:

Start from mill N: Ran irregular line westerly across Secs. 35, 34, 33 and 32 Twp. 26S R 12E. Secs. 5, 6 and 7. Twp. 27S R 12E. Secs. 1, 12 Twp. 27S R 11E. W M.

This line takes me to Timothy Meadow Ranger Station and three miles beyond- To the west; toward Antelope Basin-, along the dividing line of the two species of pine. Relative to the infestation in the lodge-pole: The same conditions exist as found elsewhere: It is greatly reduced as compared with 1913; showing fully 70% less.

Being of a higher altitude-6300ft-; the beetles have not advanced beyond the half grown larvae stage and the foliage, with few exceptions, is normal green. In a number of cases, the adult beetles are cutting the original galleries. Along this line, I find a number of instances, where the broods were over come before escaping from the tree, yet the number that did escape are in excess of those constituting the present infestation. On this reconnaissance, an examination was made of what is known as Unit No. 2.; situated on Sec. 12, T27, R 11E. This is one of the tracts that was considered a menace to the ajoining yellow pine and was selected by the Forest Service, a year ago, as one of the points of wholesale burning and where some few yellow

pine were killed in 1913 by Monticolae. In the examination of this area and the territory covered by the days work,as well,not a single yellow pine tree was found affected,in any way,by D.Monticolae.
The Brevicomis infestation in the yellow pine has increased 26% over 1913 as it stands today.

Embody Mill. Oct.14.1914.

S Meanders:

Start from mill:Thence 3 miles south to S W. Cor. Sec.13 Twp.27S R13E
Thence angled back through Secs.1 and 12.Twp.27 S.R 13E.,and Sec.36. Twp.26 S.R 13 E.W.M.

This run takes me across the flats to the south of Embodys,through a heavy stand of timber, bout equally divided between lodge-pole and yellow pine. This area was looked upon as a favorable locality wherein the lodge-pole minght be the cause of contaminating the yellow pine with Monticolae infestation. Such is not the case.
The Monticolae have,not only remained clear of the yellow pine;but to a very great degree abandoned the lodge-pole. It is not going beyond facts to say that,90% of the Monticolae infestation in the lodge-pole has disappeared,since the examination,thirteen months ago
Over the territory covered by this days work,is noted a marked increase in the Brevicomis infestation in the yellow pine- from 30% to 40% over 1913. The present infestation is in the form of larvae;but owingto the timber not having faded,little can be learned relative to recent attacks. The assertion of an increase is based on a comparison of the early broods of this year (escaped in May and June)and the infestation of last year.
The emergence of both species of beetles in the lodge-pole and yellow pine,last spring,appears to have been normal.

BEAR FLAT. Oct.15.1914.

Meanders:

Picked up line at S E.Cor.Sec.12: Twp27 S.R 11 E.Thence south 7 miles on range line to S.E.Cor.Sec.13 Twp.28 S. R 11 E: Thence east 2 miles to N.E.Cor.Sec.20.Twp.28 S. R12 E.M.M.

This line,ran through a dense forest,on the border line of the two species of pine,a distance of nine miles,fails to develop any different conditions than those noted the previous days,that is,a general and decided decrease in theMonticolae infestation in the lodge-pole and a marked increaseof Brevicomis infestation in the yellow pine. No Monticolae infestation was discovered in the yellow pine,of the year 1914.

This reconnaissance has brought under observation the principal ravaged areas of 1913;due to work of the Monticolae,in the lodge-pole. At the present time,but very little of this vast infestation is in evidence and a close examination develops the fact of a decrease of from 70% to 80% as compared with a year ago. The remaining infestation is in small clusters,irregularly,along the entire line and is in the form of larvae and parent adults,in perfectly normal green timber. The number of trees containing"over come" broods and those showing partial attacks,would indicate a weakened condition of the present, active generation.

No Monticolae infestation found in the yellow pine.

Increase of Brevicomis infestation,in yellow pine,over last year,40%to 50%. Some fading trees noted,containing Brevicomis larvae.

The greater part of this days work was in the Antelope Basin-A locality taken into consideration,in last years correspondence.

Bear Flat.Oct.16.1914.

Meanders:

Start S.W.Cor.Sec.35 Twp.28 S R.11 E(Bear Flat):Thence east on irregular line,4 miles to S.E.Cor.Sec.29. Twp.28 S.R 12 E: Thence north 2 miles to N.E.Cor.Sec.29 Twp.28 S.R12 E(picking up line of yesterday at this point): Thence return south $^1/_2$ mile to east quarter Cor Sec.28 : Thence west,3 miles through center of Secs.29,19 and 24: Thence south $1^1/_2$ miles to east quarter Cor.Sec.26:Thence south west angling Secs.26 and35 to place of beginning. An extra mile ran in Sec.29.

This line of fourteen miles was ran,for the main part on the border of the lodge-pole and yellow pine andthrough the lodge-pole belts that intersect the yellow pine,in this vicinity.

Here, we find the same conditions as elsewhere,namely:- A marked decrease of the Monticolae infestation in the lodge-pole : An increase of the Brevicomis infestation in the yellow pine : No evidence of Monticolae infestation in the yellow pine.

On this days reconnaissance,an opportunity was afforded to examine what is known as Unit No.1. This is an isolated body of lodge-pole of about 25 acres,situated at the head of the Antelope basin and is locally known as the"Island".This is the area,selected a year ago, by the Forest Service,as theinitial point to carry out their wholesale burning demonstration. Due to the lateness of the season,this was not done.

I find this area in much the same condition as a year ago,except the beetles have escaped and the foliage of the then"yellow tops" has become red. I also find,in the extreme western end of this area,a limited number of Monticolae infested trees of this year;but due to an opportunity for close observation,I can say,positively,this infestation has decreased 70%,inthe last year. Here,I would quote from my

diary -Date, Oct.16.1913,(A year ago to day)"Ran line between Associ ation and Service timber; Inspected"Unit No.1;lodge-pole area, select- ed for burning. Noted a number of "blazed"trees;for what purpose,can not say. Of these blazed trees: From 70% to 75% are infested with M.B. and from 25% to 30% are free from infestation. -?-" Also to my state ment to Mr.Kimball and Mr.Anderson,on the morning of Oct.17.1913. "The burning of Unit No.1 will show a benefit of 30% the moment the bark is scorched,even if it does not result in the killing of a single beetle!" I can only say; 30% of the marked timber, stands throughout this tract,entirely free from infestation of any kind. For the days work,the following:- Decrease of Monticolae infestation in lodge-pole,as compared with a year ago- From 70% to 90% Increase of Bevicomis infestation in yellow pine,over last year- From 40% to 60%.

No Monticolae infestation discovered in the yellow pine.

Bear Flat. Oct.17.1913.

Meanders:

Start S.W.Cor.Sec.35.(Bear Flat); Thence 2 miles north to N.W.Cor. Sec.26; Thence east 1/2 mile to south quar.Cor.Sec.23: Thence angled north-east to N.E.Cor.Sec.23;Thence angled north-west to west quar. Cor.Sec.14;Thence north $1^1/_2$ miles(dropping a quarter into Sec.3) to N.W.Cor.Sec.2;Thence east 1/2 mile to north quar.Cor.Sec.2; Thence south through Sec.2 and 11;Thence south-east to S.E.Cor.Sec 14; Thence angled to south quar.Cor.Sec.23; Thence south through center Secs.26 and 35; Thence west to place of beginning-Twp.28S.R11E This line,18 miles long,runs along the border of the two species of pine and intersects four glades of lodge-pole that are bordered by yellow pine,on all sides. One of these glades,situated in Sec.2., was the point selected by the Association to conduct a whole-sale

burning, last year. Due to climatic conditions, it was found impossible to carry out this plan.

Throughout this area, every opportunity is afforded the Monticolae to leave the lodge-pole and enter the yellow pine; but, this they have not done and instead, as in other places, have deserted the lodge-pole and disappeared from the locality, to an extent that shows a decrease of 90%, when compared with last years infestation. The Monticolae infestatio is practically wiped out; only a few scattered, weakened broods remaining. No increase in the Brevicomis infestation, in the yellow pine, was noted in this days work. It is about the same as a year ago.

No Monticolae infestation was found in the yellow pine.

The emergence of the beetles, last spring, appears to have been normal and very little faded timber is to be seen.

Concludes the examination. Start for Klamath Falls, through the Reservation, tomorrow. -Snowing-

The above is a copy from my note-book relative to the six days work on the Paulina Forest and surrounding areas and is transcribed here as written up, each night, at the close of the days work.

Ent. Ranger.